

**BEFORE THE
PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA**

DOCKET NO. 2020-3-E

In the Matter of:)	DIRECT TESTIMONY OF
Annual Review of Base Rates)	STEVE IMMEL FOR
for Fuel Costs of)	DUKE ENERGY CAROLINAS, LLC
Duke Energy Carolinas, LLC, Decreasing)	
Residential and Non-Residential Rates)	

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Steve Immel and my business address is 526 South Church Street, Charlotte,
3 North Carolina.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am the Vice President ("VP") of Fleet Transition Strategy.

6 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
7 **BACKGROUND.**

8 A. I graduated from the University of Kentucky with a Bachelor of Science degree in Civil
9 Engineering and a Masters of Business Administration from Queens College. My career
10 began with Duke Energy (d/b/a Duke Power) in 1980 as an Associate Design Engineer. Since
11 that time, I have held various roles of increasing responsibility in corporate facilities,
12 investment recovery, supply chain, and operations areas, including the role of Hydro
13 Manager; Station Manager at Allen Steam Station and then Marshall Steam Station. I was
14 named VP of Duke Energy Indiana's Midwest Regulated Operations in 2012 and VP of
15 Outage and Project Services in 2014. In 2016, I was named to VP of Carolinas Coal
16 Generation for Duke Energy Carolinas, LLC ("DEC" or the "Company") and Duke Energy
17 Progress, LLC ("DEP"). I assumed my current role in 2020.

18 **Q. WHAT ARE YOUR CURRENT DUTIES AS VP OF FLEET TRANSITION**
19 **STRATEGY?**

20 A. In this role, I am responsible for developing strategies to address various integrated resource
21 plan ("IRP") scenarios and related plans for the Fossil/Hydro workforce.

22 **Q. HAVE YOU TESTIFIED BEFORE THIS COMMISSION IN ANY PRIOR**
23 **PROCEEDINGS?**

A. Yes. I testified before the Public Service Commission of South Carolina on behalf of the Company in its most recent general rate case in Docket No. 2018-319-E and its 2019 fuel proceeding in Docket No. 2019-3-E.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to (1) describe DEC's fossil/hydro/solar generation portfolio and changes made since the 2019 fuel cost recovery proceeding, as well as those expected in the near term, (2) discuss the performance of DEC's fossil/hydro/solar facilities during the review period of June 1, 2019 through May 31, 2020 (the "review period"), (3) provide information on significant fossil/hydro/solar outages that occurred during the review period, and (4) provide information concerning environmental compliance efforts.

Q. PLEASE DESCRIBE DEC'S FOSSIL/HYDRO/SOLAR GENERATION PORTFOLIO.

A. The Company's fossil/hydro/solar generation portfolio consists of approximately 14,976 megawatts ("MWs") of generating capacity, made up as follows:

Coal-fired -	6,764 MWs
Steam Natural Gas -	170 MWs
Hydro -	3,219 MWs
Combustion Turbines -	2,665 MWs
Combined Cycle -	2,116 MWs
Solar -	30 MWs
Combined Heat and Power -	13 MWs

Allen, Belews Creek, Cliffside, and Marshall generating stations make up the Company's coal-fired generation assets, which total 13 units. These units are equipped with emissions

1 control equipment, including selective catalytic or selective non-catalytic reduction (“SCR”
2 or “SNCR”) equipment for removing nitrogen oxides (“NO_x”), and flue gas desulfurization
3 (“FGD” or “scrubber”) equipment for removing sulfur dioxide (“SO₂”).

4 The steam natural gas unit—W.S. Lee Station (“Lee”) Unit 3—is considered to be a
5 peaking unit. The Company has a total of 31 simple cycle combustion turbine (“CT”) units,
6 of which 29 are considered the larger group providing approximately 2,581 MWs of capacity.
7 These 29 units are located at Lincoln, Mill Creek, and Rockingham Stations, and are equipped
8 with water injection systems that reduce NO_x and/or have low NO_x burner equipment in use.
9 The Lee CT facility includes two units with a total capacity of 84 MWs equipped with fast-
10 start ability in support of DEC’s Oconee Nuclear Station.

11 The 2,116 MWs, shown earlier as combined cycle (“CC”), represent the Buck CC,
12 Dan River CC, and W.S. Lee CC facilities. These facilities are equipped with technology for
13 emissions control including SCRs, low NO_x burners, and carbon monoxide/volatile organic
14 compounds catalysts.

15 The Company’s hydro fleet includes two pumped storage facilities with four units
16 each that provide a total capacity of 2,140 MWs, along with conventional hydro assets
17 consisting of 59 units providing approximately 1079 MWs of capacity.

18 The 30 MWs of solar capacity are made up of 18 rooftop solar sites providing 3 MWs
19 of relative summer dependable capacity, the Mocksville solar site providing 5 MWs of relative
20 summer dependable capacity, the Monroe solar site providing 19 MWs of relative summer
21 dependable capacity, and the Woodleaf solar site providing 2 MWs of relative summer
22 dependable capacity.

1 **Q. WHAT CAPACITY CHANGES HAVE OCCURRED WITHIN THE FLEET SINCE**
2 **THE LAST FUEL CASE?**

3 A. Belews Creek Unit 1 was upgraded to allow for co-fired operation, allowing utilization of coal
4 and natural gas. Clemson Combined Heat and Power ("CHP") plant went into service in
5 December 2019. The CHP will provide Clemson University steam and the system with 13
6 MWs of capacity. DEC also entered into an agreement whereby the Company sold five hydro
7 generating stations to Northbrook Carolina Hydro II, LLC and Northbrook Tuxedo, LLC.
8 The facilities have a combined 18.7 MW generation capacity and consist of the Bryson Hydro
9 Station, the Franklin Hydro Station, the Mission Hydro Station, the Tuxedo Hydro Station,
10 and the Gaston Shoals Hydro Station. Four of the facilities are in North Carolina, and the fifth
11 is in South Carolina.

12 **Q. WHAT ARE DEC'S OBJECTIVES IN THE OPERATION OF ITS**
13 **FOSSIL/HYDRO/SOLAR FACILITIES?**

14 A. The primary objective of DEC's fossil/hydro/solar generation department is to provide safe,
15 reliable, and cost-effective electricity to DEC's customers. Operations personnel and other
16 station employees are well-trained and execute their responsibilities to the highest standards
17 in accordance with procedures, guidelines, and a standard operating model. Like safety,
18 environmental compliance is a "first principle" and DEC works very hard to achieve high
19 level results.

20 The Company complies with all applicable environmental regulations and maintains
21 station equipment and systems in a cost-effective manner to ensure reliability for customers.
22 The Company also acts in a timely manner to implement work plans and projects that enhance
23 the safety and performance of systems, equipment, and personnel, consistent with providing

low-cost power options for DEC's customers. Equipment inspection and maintenance outages are generally scheduled during the spring and fall months when customer demand is reduced due to milder temperatures. These outages are well-planned and executed to prepare the unit for reliable operation until the next planned outage to maximize value for customers.

Q. WHAT IS HEAT RATE?

A. Heat rate is a measure of the amount of thermal energy needed to generate a given amount of electric energy and is expressed as British thermal units ("Btu") per kilowatt-hour ("kWh"). A low heat rate indicates an efficient fleet that uses less heat energy from fuel to generate electrical energy.

Q. WHAT WAS THE HEAT RATE OF DEC'S COAL UNITS DURING THE REVIEW PERIOD?

A. Over the review period, the average heat rate for DEC's coal fleet was 9,643 Btu/kWh. DEC's Rogers Energy Complex ("Cliffside"), Belews Creek Steam Station ("Belews Creek"), Marshall Steam Station ("Marshall"), and Allen Steam Station ("Allen") coal-fired generating stations have heat rates of 9,396 Btu/kWh, 9,520 Btu/kWh, 9,703 Btu/kWh, and 11,778 Btu/kWh, respectively. For the review period, the Belews Creek units provided 29 percent of coal-fired generation for DEC, with the Marshall units providing 36 percent, Cliffside units providing 30 percent, and Allen units providing 4 percent.

Q. HOW MUCH GENERATION DID EACH TYPE OF FOSSIL/HYDRO/SOLAR GENERATING FACILITY PROVIDE FOR THE REVIEW PERIOD AND HOW DOES DEC UTILIZE EACH TYPE OF GENERATING FACILITY TO SERVE CUSTOMERS?

1 A. The Company's system generation totaled 97,341,544 MW hours ("MWhs") for the review
2 period. The fossil/hydro/solar fleet provided 37,361,764 MWhs, or approximately 38 percent
3 of the total generation. The breakdown includes a 19 percent contribution from the coal-fired
4 stations, approximately 15 percent from CC operations, 1 percent contribution for the CTs, 2
5 percent from the hydro facilities, 0.2 percent from the solar facilities, and approximately 1
6 percent from the steam natural gas facility, Lee Unit 3.

7 The Company's portfolio includes a diverse mix of units that, along with additional
8 nuclear capacity, allow DEC to meet the dynamics of customer load requirements in a logical
9 and cost-effective manner. Additionally, DEC has utilized the Joint Dispatch Agreement
10 ("JDA"), which allows generating resources for DEC and DEP to be dispatched as a single
11 system to enhance dispatching the lowest cost resources available. The cost and operational
12 characteristics of each unit generally determine the type of customer load situation (e.g., base
13 and peak load requirements) that a unit would be called upon, or dispatched, to support.
14 Additionally, the dual fuel optionality technology at Cliffside and Belews Creek has aided the
15 Company's ability to dispatch lower cost resources.

16 **Q. HOW DID DEC COST EFFECTIVELY DISPATCH THE DIVERSE MIX OF**
17 **GENERATING UNITS DURING THE REVIEW PERIOD?**

18 A. The Company, like other utilities across the U.S., has experienced a change in the dispatch
19 order for each type of generating facility due to favorable economics resulting from the low
20 pricing of natural gas. Further, the addition of new CC units within the Carolinas' portfolio
21 in recent years has provided DEC with additional natural gas resources that feature state-of-
22 the-art technology for increased efficiency and significantly reduced emissions. These factors

1 promote the use of natural gas and provide real benefits in cost of fuel and reduced emissions
2 for customers.

3 **Q. PLEASE DISCUSS THE OPERATIONAL RESULTS FOR DEC'S**
4 **FOSSIL/HYDRO/SOLAR FLEET DURING THE REVIEW PERIOD.**

5 A. The Company's generating units operated efficiently and reliably during the review period.
6 Several key measures are used to evaluate the operational performance depending on the
7 generator type: (1) equivalent availability factor ("EAF"), which refers to the percent of a
8 given time period a facility was available to operate at full power, if needed (EAF is not
9 affected by the manner in which the unit is dispatched or by the system demands; it is
10 impacted, however, by planned and unplanned (*i.e.*, forced) outage time); (2) net capacity
11 factor ("NCF"), which measures the generation that a facility actually produces against the
12 amount of generation that theoretically could be produced in a given time period, based upon
13 its maximum dependable capacity (NCF *is* affected by the dispatch of the unit to serve
14 customer needs); (3) equivalent forced outage rate ("EFOR"), which represents the percentage
15 of unit failure (unplanned outage hours and equivalent unplanned derated¹ hours); a low
16 EFOR represents fewer unplanned outage and derated hours, which equates to a higher
17 reliability measure; and, (4) starting reliability, which represents the percentage of successful
18 starts.

19 The following chart provides operational results categorized by generator type, as well
20 as results from the most recently published North American Electric Reliability Council
21 ("NERC") Generating Unit Statistical Brochure representing the period 2014 through 2018.
22 The NERC data reported for the coal-fired units represents an average of comparable units

¹ Derated hours are hours the unit operation was less than full capacity.

based on capacity rating. The data in the chart reflects DEC results compared to NERC five-year comparisons.

Generator Type	Measure	Review Period	2014-2018	Nbr of Units
		DEC Operational Results	NERC Average	
<i>Coal-Fired Test Period</i>	EAFF	78.0%	77.3%	712
	EFOR	8.2%	9.3%	
<i>Coal-Fired Summer Peak</i>	EAFF	92.6%	n/a	n/a
<i>Total CC Average</i>	EAFF	85.9%	84.9%	333
	NCF	75.1%	53.6%	
	EFOR	0.68%	5.1%	
<i>CC Summer Peak</i>	EAFF	93.94%	n/a	n/a
<i>Total CT Average</i>	EAFF	82.8%	87.5%	750
	SR	100.0%	98.3%	
<i>Hydro</i>	EAFF	76.9%	80.2%	1,063

Q. PLEASE DISCUSS SIGNIFICANT OUTAGES OCCURRING AT DEC'S FOSSIL/HYDRO/SOLAR FACILITIES DURING THE REVIEW PERIOD.

A. In general, planned maintenance outages for all fossil and larger hydro units are scheduled for the spring and fall to maximize unit availability during periods of peak demand. Most of these units had at least one small planned outage during this review period to inspect and maintain plant equipment.

Lee Station conducted an outage in the Fall 2019. The primary purpose of the outage was for Transmission to perform Bus Tie breaker and 100kv Bus Junction breaker upgrades.

In Fall 2019, Belews Creek Unit 1 performed a boiler outage. The primary purpose of the outage was to replace the horizontal reheat section of the boiler, burner installation for the natural gas co-fire conversion, and precipitator upgrades. Belews Creek Unit 2 was also in an outage to perform work on common service water pipe replacement between units, continuous emission monitoring system upgrade, main battery replacement, and control system power supply upgrade. Marshall Unit 2 completed an outage in Fall 2019. The

1 primary purpose of this outage was to perform FGD inspections, repair absorber agitators,
2 and replace check valves. Marshall Unit 1 also had an outage in Fall 2019 to replace the
3 generator and transformer protective relays and air preheater baskets. Cliffside Unit 5
4 performed ammonia tank inspections, catalysts replacement, and turbine valve work in Fall
5 2019.

6 In Spring 2020, Belews Creek Unit 1 had an outage to make repairs to high pressure
7 and low pressure hydrogen coolers. Cliffside Unit 5 had an outage in Spring 2020 to replace
8 an induced fan motor transformer, install new hydrogen dryers, and conduct annual
9 inspections, and preventive maintenance.

10 **Q. HOW DOES DEC ENSURE EMISSIONS REDUCTIONS FOR ENVIRONMENTAL**
11 **COMPLIANCE?**

12 A. The Company has installed pollution control equipment to meet various current federal, state,
13 and local reduction requirements for NO_x and SO₂ emissions. The SCR technology that DEC
14 currently operates on the coal-fired units uses ammonia or urea for NO_x removal. The SNCR
15 technology employed at Allen station and Marshall Units 1, 2 and 4 injects urea into the boiler
16 for NO_x removal. All DEC coal units have wet scrubbers installed which use crushed
17 limestone for SO₂ removal. Cliffside 6 has a state-of-the-art SO₂ reduction system which
18 couples a wet scrubber (e.g., limestone) and dry scrubber (e.g., quicklime). SCR equipment
19 is also an integral part of the design of the Buck and Dan River CC Stations in which aqueous
20 ammonia is introduced for NO_x removal.

21 Overall, the type and quantity of chemicals used to reduce emissions at the plants
22 varies depending on the generation output of the unit, the chemical constituents in the fuel
23 burned, and/or the level of emissions reduction required. The Company is managing the

1 impacts, favorable or unfavorable, as a result of changes to the fuel mix and/or changes in
2 coal burn due to competing fuels and utilization of non-traditional coals. Overall, the goal is
3 to effectively comply with emissions regulations and provide the optimal total-cost solution
4 for operation of the unit. The Company will continue to leverage new technologies and
5 chemicals to meet both present and future state and federal emission requirements including
6 the Mercury and Air Toxics Standards (“MATS”) rule. MATS chemicals that DEC uses
7 when required to reduce emissions include, but may not be limited to, activated carbon,
8 mercury oxidation chemicals, and mercury re-emission prevention chemicals. Company
9 witness McGee provides the cost information for DEC’s chemical use and forecast.

10 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

11 **A.** Yes, it does.